CLAIMS:

1. A direct smelting plant for producing molten metal from a metalliferous feed material including:

(a) a fixed smelting vessel to hold a molten bath of metal and slag and a gas space above the bath;

(b) a solids feed means to supply solid feed material into the vessel, the solids feed means including two or more pairs of solids injection lances arranged around and extending into the vessel, and a main supply line and a pair of branch lines for supplying solid feed material to the lances of each pair of lances with the branch lines interconnecting the main supply line and the lances of the pair of lances, and with the lances of each pair of lances being diametrically opposed to each other, and with at least one pair of lances being provided for injecting metalliferous feed material and at least one of the other pairs of lances being provided for injecting solid carbonaceous material, and with the pairs of lances being arranged around the vessel so that adjacent lances are lances that are provided to inject different materials;

(c) a gas injection means extending downwardly into the vessel to inject an oxygen-containing gas into the gas space and/or the bath in the vessel;

(d) a gas delivery duct means extending from a gas supply location away from the vessel to a delivery location above the vessel for delivering the oxygen-containing gas into the gas injection means;

(e) an offgas duct means for facilitating flow of offgas from the vessel away from the vessel;

(f) a metal tapping means for tapping

molten metal from the bath and transporting that molten metal away from the vessel; and

(g) a slag tapping means for tapping slag from the bath and transporting that slag away from the vessel.

2. The plant defined in claim 1 wherein the solids injection lances are arranged to extend downwardly and inwardly into the vessel through openings in a side wall of the vessel.

3. The plant defined in claim 2 wherein the lance openings in the side wall of the vessel are located at the same height of the vessel and are spaced at equal distances around the circumference of the vessel.

4. The plant defined in claim 1 wherein the branch lines for each pair of solids injection lances are substantially the same length.

5. The plant defined in claim 1 wherein the branch line for each lance includes an upwardly extending section, and an inwardly and downwardly extending section that extends from an upper end of the upwardly extending section and is connected to an inlet of the lance and is coaxial with the lance.

6. The plant defined in claim 5 wherein the upwardly extending section and the inwardly and downwardly extending section describe an acute angle.

7. The plant defined in claim 1 wherein the solids feed means is adapted to supply one or more of (a) pre-heated metalliferous feed material, (b) metalliferous feed material at ambient temperature, and (c) a blend of pre-heated and ambient temperature metalliferous feed material to the metalliferous feed material lances.

8. The plant defined in claim 1 wherein the solids feed means includes a hot metalliferous feed material injection system for supplying pre-heated metalliferous feed material to the main supply line or lines for the metalliferous feed material lances.

9. The plant defined in claim 8 wherein the hot metalliferous feed material injection system includes a hot metalliferous feed material transfer means that includes the main supply line or lines and a supply of a carrier gas, such as an inert gas, for transporting the hot metalliferous feed material from a pre-heater and/or pre-reduction unit to the metalliferous feed material lances.

10. The plant defined in claim 9 wherein the metalliferous feed material is iron ore fines.

11. The plant defined in claim 10 wherein the hot metalliferous feed material injection system is operable to pre-heat the iron ore fines so that the iron ore fines for injection into the vessel at a temperature in the range of 650-700°C.

12. The plant defined in claim 1 wherein the metal tapping means and the slag tapping means are different units with a separate metal tap hole and a separate slag tap hole located at different heights of the vessel.

13. The plant defined in claim 12 wherein the metal tapping means includes a metal flow forehearth projecting outwardly from the vessel for tapping molten metal continuously from the vessel.

14. The plant defined in claim 13 wherein the metal tapping means includes a metal tapping launder for receiving molten metal from the forehearth.

15. The plant defined in claim 12 wherein the slag tapping means includes a slag tapping launder for receiving molten slag from the bath.

16. A direct smelting plant for producing molten metal from a metalliferous feed material including:

(a) a fixed smelting vessel to hold a molten bath of metal and slag and a gas space above the bath;

(b) a solids feed means to supply solid feed material into the vessel, the solids feed means including solids injection lances arranged around and extending into the vessel, and supply lines for supplying solid feed material to the lances, and with at least one lance being provided for injecting metalliferous feed material and at least one of the other lances being provided for injecting solid carbonaceous material, and the lance supply line for at least one lance including an upwardly extending section, and an inwardly and downwardly extending section that extends from an upper end of the upwardly extending section and is connected to an inlet of the lance and is coaxial with the lance.

(c) a gas injection means extending downwardly into the vessel to inject an oxygen-containing gas into the gas space and/or the bath in the vessel;

(d) a gas delivery duct means extending from a gas supply location away from the vessel to a delivery location above the vessel for delivering the oxygen-containing gas into the gas injection means;

(e) an offgas duct means for facilitating flow of offgas from the vessel away from the vessel;

(f) a metal tapping means for tapping molten metal from the bath and transporting that molten metal away from the vessel; and

(g) a slag tapping means for tapping slag from the bath and transporting that slag away from the vessel.

17. The plant defined in claim 16 wherein the upwardly extending section and the inwardly and downwardly extending section of the solids injection lance supply means describes an acute angle.

18. The plant defined in claim 17 wherein the solids injection lances are arranged in pairs around the vessel, and the supply lines include a main supply line and a pair of branch lines for supplying solid feed material to the lances of each pair of lances with the branch lines interconnecting the main supply line and the lances of the pair of lances, and with the lances of each pair of lances being diametrically opposed to each other, and with at least one pair of lances being provided for injecting metalliferous feed material and at least one of the other pairs of lances being provided for injecting solid carbonaceous material, and with the pairs of lances being arranged around the vessel so that adjacent lances are lances that are provided to inject different materials.